

Annual Air Quality Monitoring Report - Blenheim and Picton 2009

Technical publication No. 10-003

February 2010



MARLBOROUGH
DISTRICT COUNCIL



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MDC Technical Report No: 10-003

ISBN 978-0-9864611-1-8

File Reference: E225-A02

February 2010

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Executive Summary

In Marlborough the main air contaminant of concern is PM₁₀ (particles in the air less than 10 microns in diameter). In 2009, monitoring for PM₁₀ took place at the historical PM₁₀ monitoring site in Middle Renwick Road (MRR) and at the Redwoodtown Bowling Club in Blenheim. The methods of monitoring were a gravimetric high volume sampler at Middle Renwick Road and a Met One Beta Attenuation Monitor (BAM) at the Redwoodtown site.

The 2009 Air Quality Monitoring report compares PM₁₀ concentrations to the National Environmental Standard for Air Quality (NES) of 50 µg m⁻³ (24-hour average) and to the Ministry for the Environment's air quality guidelines and indicator categories. The NES for PM₁₀ allows one exceedence of 50 µg m⁻³ (24-hour average) per year.

Concentrations of PM₁₀ exceeded 50 µg m⁻³ (24-hour average) on one occasion during 2009 at the Redwoodtown air quality monitoring site. The measured concentration was 51 µg m⁻³ and does not constitute a breach of the NES. In 2009 concentrations of PM₁₀ in Blenheim were within the straight line path for compliance with the NES.

Historically PM₁₀ concentrations have exceeded the NES at the Redwoodtown air quality monitoring site. In 2008, 50 µg m⁻³ was exceeded on three occasions, resulting in two breaches of the NES. The annual average PM₁₀ concentration for the Bowling Club site was 15 µg m⁻³ and is therefore less than the annual average guideline for PM₁₀ of 20 µg m⁻³.

In 2009 the maximum concentration recorded at the MRR site was 32 µg m⁻³. Previously exceedences have occurred at this site in 2000, 2003 and 2008. However, high concentrations in excess of the NES are not typical. The annual average PM₁₀ concentrations estimated for MRR for 2009 was 12 µg m⁻³.

No exceedences of 50 µg m⁻³ were recorded in Picton in 2009. The maximum measured PM₁₀ concentration was 31 µg m⁻³ (24-hour average) and is lower than the maximum for 2008 of 53 µg m⁻³. While there were no measured exceedences of 50 µg m⁻³ in 2009, sampling was carried out on a one day in three basis so it is possible that concentrations exceeded 50 µg m⁻³ on a non sample day.

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1. Introduction

The main contaminant of concern in Marlborough is particles in the air less than 10 microns in diameter, known as PM₁₀. Historically, concentrations of PM₁₀ have exceeded national environmental standards (NES) in Blenheim during the winter months.

Concentrations of PM₁₀ were measured at three air quality monitoring sites in Marlborough during 2009. These were the air quality monitoring site at the Redwoodtown Bowling Club, a site at 106 Middle Renwick Road (MRR) and at an air quality monitoring site in Picton that was established in 2008.

In Marlborough previous air quality monitoring includes historical monitoring of PM₁₀ at the MRR monitoring site, intermittent monitoring of PM₁₀ at the Redwoodtown Bowling Club site, survey PM₁₀ monitoring at Picton and Renwick during 2000 and 2002 respectively, visibility surveys and passive sampling for nitrogen oxides and sulphur oxides. From 2007 to early 2008, PM₁₀ concentrations were measured at the Croquet Club in Redwoodtown. A site on Brooklyn Street in Redwoodtown was temporarily used to measure PM₁₀ concentrations during 2004.

In 2004 the Ministry for the Environment introduced National Environmental Standards for ambient air quality (NES) (MfE, 2004). Table 1.1 shows the contaminant, the concentration, averaging period and allowable exceedances as required by the NES.

Air quality monitoring data in other urban areas of New Zealand indicates that it would seem unlikely that concentrations of NES contaminants other than PM₁₀ would be in breach in Blenheim. Concentrations of other contaminants even in large urban areas are typically within the NES and guideline concentrations. Because emissions of other contaminants in Blenheim are far lower than large urban areas such as Christchurch, it would seem unlikely that concentrations of other key urban air pollutants would be in breach of the NES or air quality guidelines. The exception to this may be benzo(a)pyrene concentrations, which appear to occur well in excess of guideline concentrations in Christchurch. The NES includes specifications for monitoring PM₁₀ in areas such as Blenheim where breaches are likely.

If the NES is not met by 2013, Councils will be unable to grant resource consents for discharges of PM₁₀ to air for that Airshed (MfE, 2004). The NES requires that between September 2005 and 2013 consents for discharges to air can only be granted if Councils can demonstrate a "straight-line path" to compliance that will not be impinged on by the granting of the consent. This applies only to the airshed which is non-compliant with the NES and if the proposed discharge is likely to result in a "significant" increase in PM₁₀ concentrations.

The amended regulation (August, 2005) includes slightly different specifications for areas where an operative air quality plan specifies a curved line path to achieving the NES by 2013. The curved line path is not relevant to Blenheim because the air quality plan does not include a curved line path to managing PM₁₀ concentrations. In 2009 a review of the NES was announced by the Minister for the Environment.

The Ministry for the Environment also provides guidelines for ambient air quality (MfE, 2002). Table 1.2 shows the ambient air quality guidelines and Table 1.3 details the air quality indicator categories to assist in the presentation and management of air quality in New Zealand. Air quality monitoring data in this report are presented relative to air quality guidelines and these indicator categories. These categories provide a useful perspective on the overall air quality and provide a valuable tool for evaluating trends in concentrations over time.

Table 1.1: National Environmental Standards for ambient air quality (MfE, 2004)

Contaminant	NES values		
	Concentration	Averaging Period	Allowable exceedences per year
Carbon monoxide	10 mg m ⁻³	8-hour	1
Particles (PM ₁₀)	50 µg m ⁻³	24-hour	1
Nitrogen dioxide	200 µg m ⁻³	1-hour	9
Sulphur dioxide ^b	350 µg m ⁻³	1-hour	9
Sulphur dioxide ^b	570 µg m ⁻³	1-hour	0
Ozone	150 µg m ⁻³	1-hour	0

Table 1.2: Ambient air quality guidelines for New Zealand (MfE, 2002)

Contaminant	2002 guideline values	
	Concentration ^a	Averaging Period
Carbon monoxide	30 mg m ⁻³	1-hour
	10 mg m ⁻³	8-hour
Particles (PM ₁₀)	50 µg m ⁻³	24-hour
	20 g m ⁻³	Annual
Nitrogen dioxide	200 µg m ⁻³	1-hour
	100 µg m ⁻³	24-hour
Sulphur dioxide ^b	350 µg m ⁻³	1-hour
	120 µg m ⁻³	24-hour
Ozone	150 µg m ⁻³	1-hour
	100 µg m ⁻³	8-hour
Hydrogen sulphide ^c	7 µg m ⁻³	1-hour
Lead ^d	0.2 µg m ⁻³ (lead content of PM ₁₀)	3-month moving, calculated monthly
Benzene (year 2002)	10 µg m ⁻³	Annual
Benzene (year 2010)	3.6 µg m ⁻³	Annual
1,3-Butadiene	2.4 µg m ⁻³	Annual
Formaldehyde	100 µg m ⁻³	30-minutes
Acetaldehyde	30 µg m ⁻³	Annual
Benzo(a)pyrene	0.0003 µg m ⁻³	Annual
Mercury (inorganic) ^d	0.33 µg m ⁻³	Annual
Mercury (organic)	0.13 µg m ⁻³	Annual
Chromium VI ^d	0.0011 µg m ⁻³	Annual
Chromium metal and chromium III	0.11 µg m ⁻³	Annual
Arsenic (inorganic) ^d	0.0055 µg m ⁻³	Annual
Arsine	0.055 µg m ⁻³	Annual

Notes:

^a All values apply to the gas measured at standard conditions of temperature (0° C) and pressure (1 atmosphere).

^b The sulphur dioxide guideline values do not apply to sulphur acid mist.

^c The hydrogen sulphide value is based on odour nuisance and may be unsuitable for use in geothermal areas.

^d The guideline values for metals are for inhalation exposure only; they do not include exposure from other routes such as ingestion. These other routes should be considered in assessments where appropriate.

Table 1.3: Environmental Performance Indicator categories for air quality (MfE, 2002)

Category	Value relative to guideline	Comment
Excellent	Less than 10% of the guideline	Of little concern: if maximum values are less than a tenth of the guideline, average values are likely to be much less
Good	Between 10% and 33% of the guideline	Peak measurements in this range are unlikely to affect air quality
Acceptable	Between 33% and 66% of the guideline	A broad category, where maximum values might be of concern in some sensitive locations but generally they are at a level which does not warrant urgent action
Alert	Between 66% and 100% of the guideline	This is a warning level, which can lead to exceedences if trends are not curbed
Action	More than 100% of the guideline	Exceedences of the guideline are a cause for concern and warrant action, particularly if they occur on a regular basis

In 2005 an emission inventory was undertaken in Blenheim to determine the sources of PM₁₀ and other contaminant emissions (Wilton, 2005b). The results of the survey indicated that domestic home heating was the main source of PM₁₀ emissions, contributing to around 85% of the daily wintertime PM₁₀ (Wilton, 2005b). Motor vehicles contributed to 7% of PM₁₀ emissions, outdoor burning contributed to 6% and industry contributed to 2% of total wintertime emissions.

2. Methodology

During 2009, two air quality monitoring methods were used to measure PM₁₀ concentrations in Marlborough. At the Redwoodtown - Bowling Club site in Blenheim, a Met One beta attenuation monitor (BAM) was used. This method is NES compliant and provides continuous hourly average PM₁₀ concentrations.

A gravimetric high-volume sampler, a method compliant with the MfE (2002) reference method specifications, was used at the MMR site and the Picton site. High-volume sampling was carried out on a one day in three sampling regime with samples collected over a 24-hour period from midnight to midnight.

Meteorological data, including wind speed, wind direction, ambient temperature and relative humidity were obtained from a NIWA site on the outskirts of Blenheim.

2.1. Air quality monitoring sites

There are two permanent air quality monitoring sites in Blenheim, the Redwoodtown Bowling Club site and the Middle Renwick Road (MRR) site. Figure 2.1 shows the MRR site, which provides a historical record of PM₁₀ in Blenheim and is located to the north-west of Blenheim, the Redwoodtown Bowling Club site which has been operational since 2002, and the metrological monitoring site.

In 2007 a site at the Croquet Club was established for the purposes of evaluating the relationship between Brooklyn Street area PM₁₀ and PM₁₀ concentrations measured at the Bowling Club. This was considered important because PM₁₀ concentrations of the magnitude measured during 2004 at Brooklyn Street had not been measured at the Bowling Club and because the reductions required in PM₁₀ concentrations in Blenheim had been dependent on the Brooklyn Street results. The results from work undertaken in 2007 and reported in the '2007 Air Quality Monitoring Report' (Wilton, 2008) indicated that the Brooklyn Street site was likely to be affected by localised sources of PM₁₀ and should not be used for air quality management purposes. Details of the Croquet Club site are outlined in '2008 Air Quality Monitoring Report' (Wilton and Baynes, 2009).



Figure 2.1: Location of air quality sites and metrological site in Blenheim for 2009

2.1.1. Middle Renwick Road (MRR) monitoring site

In 2000, the MRR air quality monitoring site was established at the back yard area of a Council site at 106 Middle Renwick Road. An aerial picture of the MMR site and its surrounds are shown in Figure 2.2, and Figure 2.3 shows the high volume sampler located at the MRR monitoring site. Table 2.1 provides site details for the site.



Figure 2.2: Aerial photo of the MRR air quality monitoring site (note: pink dot depicts monitoring site).



Figure 2.3: PM₁₀ monitor at the MRR air monitoring site

Table 2.1: Site summary details for the MRR air quality monitoring site.

Site name	Blenheim - 106 Middle Renwick Road
Site contact details	Marlborough District Council
Description of site	Empty sealed back yard area
Site category	Residential neighbourhood
Purpose of site and sources	To measure ambient air concentrations of PM ₁₀ at the historical air quality monitoring site in Blenheim. Main source during the winter months is solid fuel burning for domestic heating.
Proposed duration of monitoring	Ongoing
Contaminants monitored	PM ₁₀
Site co-ordinates	E 2589778 N 5964037
Date of site installation	January 2000
Meteorological characteristics of area	Low wind speeds occur regularly during the winter months. Temperature inversions are likely.
Sample frequency	One day in three from May 2005 One day in six prior to this during the summer and one day in three during the winter.
Inlet height	1.5 metres
Averaging period	24-hour

2.1.2. Redwoodtown - Bowling Club Monitoring Site

In 2009 air quality monitoring took place at the permanent air quality monitoring site at the Blenheim Bowling Club on Weld Street in Redwoodtown. Figures 2.4 and 2.5 show the surrounding area and the location of the monitoring site within the Bowling Club grounds. Summary site details are given in Table 2.2.



Figure 2.4: Aerial photo of the Redwoodtown - Bowling Club air quality monitoring site (note: pink dot depicts monitoring site).



Figure 2.5: PM₁₀ monitor at the Redwoodtown - Bowling Club air quality monitoring site (note picture depicts high volume sampler but indicates current location of the BAM).

Table 2.2: Site summary details for the Redwoodtown - Bowling Club air quality monitoring site.

Site name	Redwoodtown - Bowling Club
Site contact details	Marlborough District Council
Description of site	The site is located at the Blenheim Bowling Club, which is to the south-east of central Blenheim. The surrounding area includes a bowling green, gravel petanque area and paved areas.
Site category	Residential neighbourhood
Purpose of site and sources	To measure worst-case ambient air concentrations of PM ₁₀ in Blenheim. The main source during the winter months is solid fuel burning for domestic heating. The site is downwind of a large residential area for meteorological conditions conducive to poor air quality.
Proposed duration of monitoring	Ongoing
Contaminants monitored	PM ₁₀
Site co-ordinates	2589778E, 5964037N
Date of site installation	Monitoring from 2000-2003. Permanent site since 2005.
Meteorological characteristics of area	Low wind speeds occur regularly during the winter months. Temperature inversions are likely.
Sample frequency	One day in three
Inlet height	1.5 metres
Averaging period	24-hour

2.1.3. Picton

The Picton monitoring site was established in May 2008 to provide an indication of PM₁₀ concentrations and to determine if further air quality monitoring will be required. Figure 2.7 shows that location of monitoring site at Lincoln Street. Figure 2.8 shows the high volume sampler at the Lincoln Street site. Site details are shown in Table 2.4.



Figure 2.6: Location of the Picton monitoring site on Lincoln Street.



Figure 2.7: High volume sampler at the Lincoln Street site.

Table 2.3: Site summary details for the Picton air quality monitoring site.

Site name	Picton
Site contact details	Lincoln Street - Picton
Description of site	The site is located at the bottom of Victoria Park in Picton, which is to the northeast of Picton township
Site category	Residential neighbourhood
Purpose of site and sources	To determine PM ₁₀ concentrations in Picton and evaluate if further air quality monitoring is necessary.
Proposed duration of monitoring	2008
Contaminants monitored	PM ₁₀
Site co-ordinates	2595170E 5990899N
Date of site installation	May 2008
Meteorological characteristics of area	Low wind speeds occur regularly during the winter months. Temperature inversions are likely.
Sample frequency	One day in three
Inlet height	1.5 metres
Averaging period	24-hour

2.2. Quality assurance

Marlborough District Council staff operated the high volume PM₁₀ samplers, including filter changing.

Flow calibrations were carried out every month, normally during the morning. Filters were couriered to Environmental Laboratories Services (ELS) Ltd, who undertook filter weighing in accordance with the New Zealand and Australia standard for high volume sampling. ELS Ltd hold IANZ accreditation, for high volume PM₁₀ sampling.

Transportation of filters occurs at the end of each month, with filters stored and transported in snaplock bags at ambient temperature. Quality assurance methods include the analysis of one field blank per site per month. Field blanks outside of the "acceptable" range (± 8 mg per filter) are noted in a report from ELS Ltd.

Operation of the BAM is also carried out by MDC staff. Hourly data is recorded by the instrument and logged by an iQuest iRIS 320 datalogger. Results are telemetered hourly to MDC and stored in the hydrotel database.

3. Air quality monitoring in Blenheim

3.1. PM₁₀ concentrations at the MRR site

The daily average PM₁₀ concentrations measured at the MRR site in 2009 are shown in Figure 3.1. The maximum concentration recorded by the high volume sampler was 32 µg m⁻³ (24 hour average).

In 2008 the maximum concentration recorded was 51 µg m⁻³. The only other years that concentrations above 50 µg m⁻³ have been recorded at this site are 2000 (56 µg m⁻³) 2003 (75 µg m⁻³) and 2008 (51 µg m⁻³).

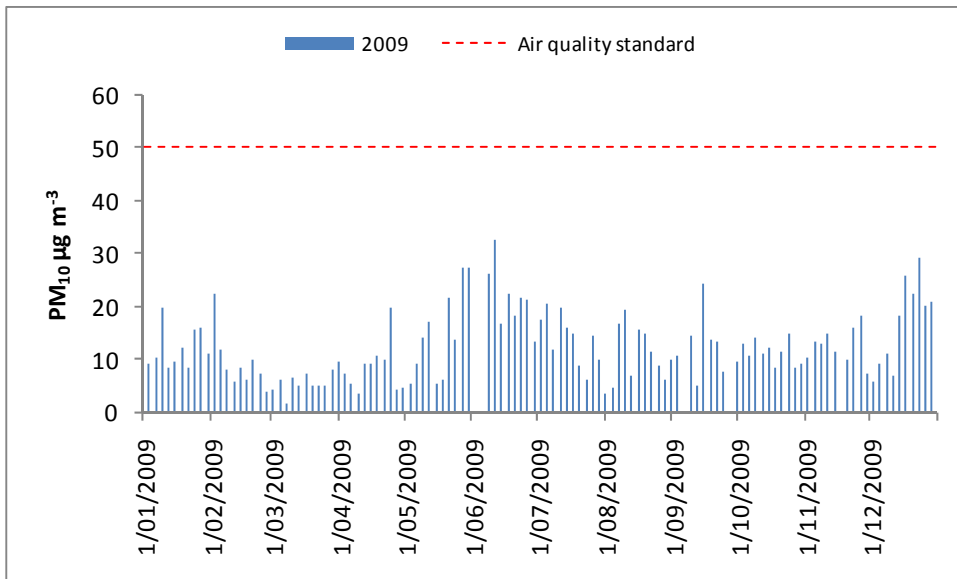


Figure 3.1: Daily winter PM₁₀ concentrations measured at the MRR site during 2009.

Figure 3.2 shows changes in PM₁₀ concentrations relative to MfE air quality indicator categories (shown in Table 1.3) at the MRR site from 2000 to 2009. All of the PM₁₀ concentrations measured in 2009 were less than 66% of the air quality guideline, that is, within the “acceptable” and “good” air quality categories. Monthly variations in PM₁₀ concentrations compared to air quality indicators for 2009 are shown in Figure 3.3. Figure 3.4 shows the number of days when the NES was exceeded, the maximum concentration and the second highest concentration for 2009 and for previous years.

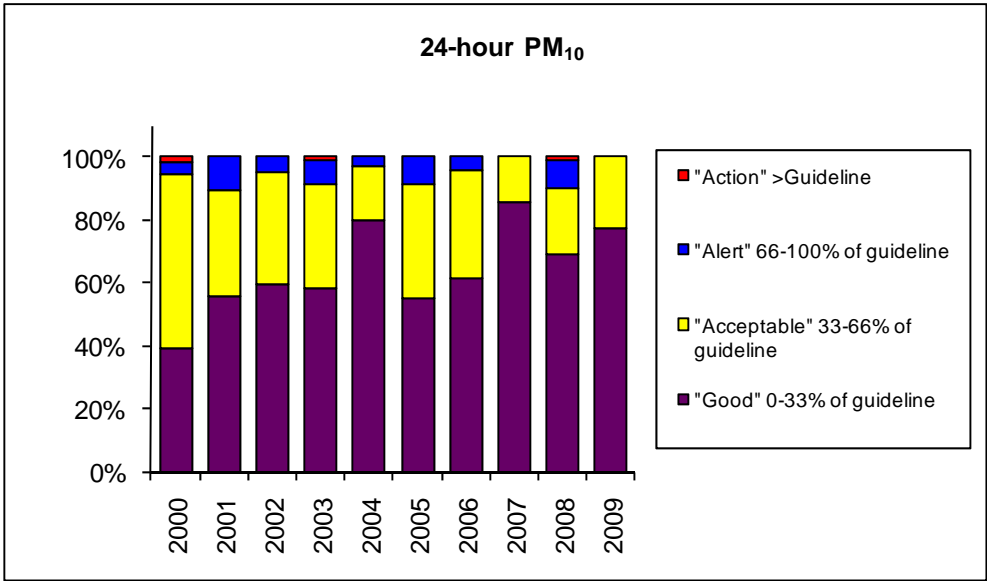


Figure 3.2: Comparison of PM₁₀ concentrations measured at the MRR site from 2000 to 2009 to air quality indicator categories.

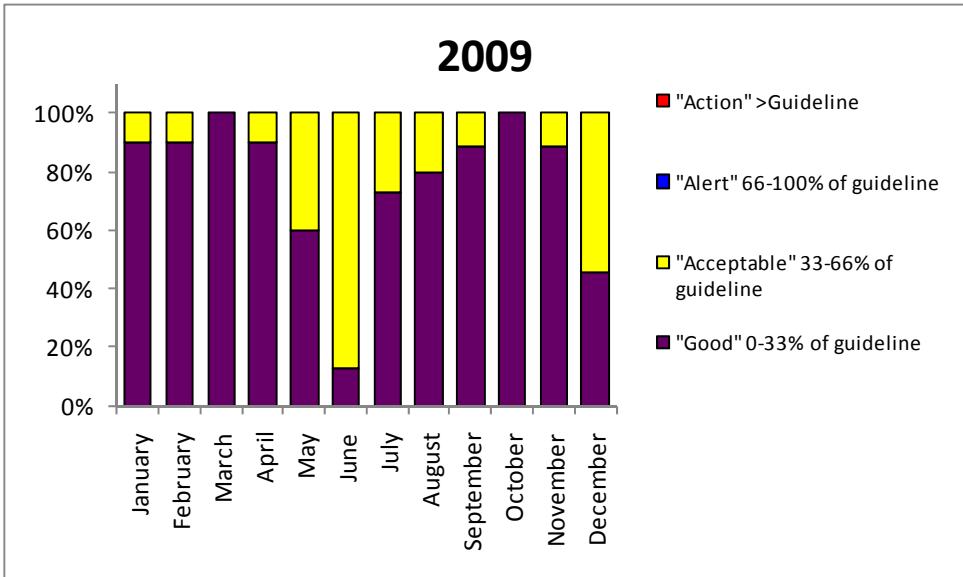


Figure 3.3: Comparison of daily PM₁₀ concentrations each month during 2009 to air quality indicator categories at the MRR site.

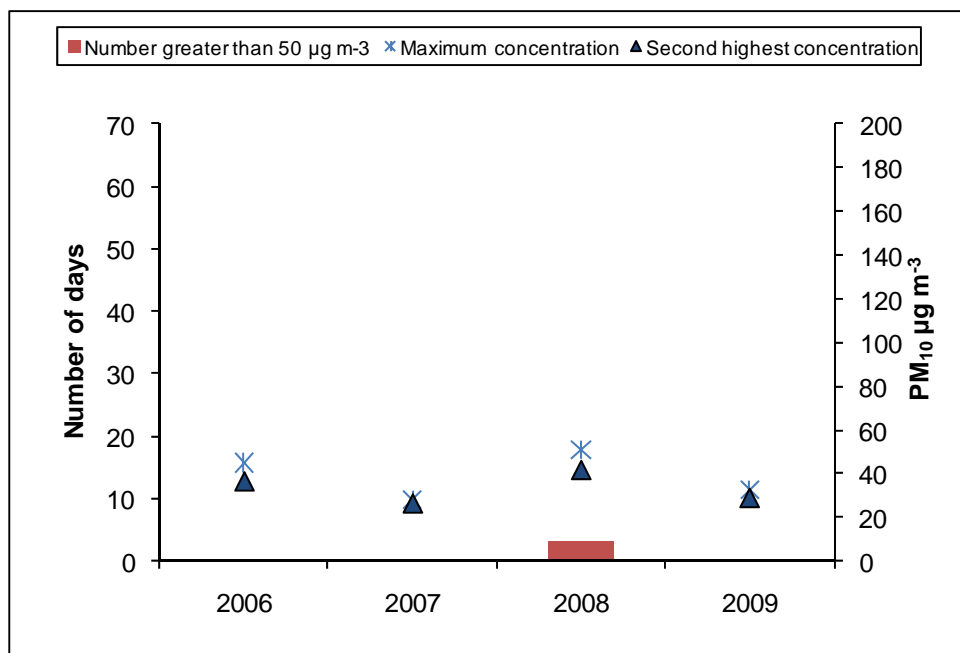


Figure 3.4: Number of days when the NES was exceeded, the maximum concentration and the second highest concentration from 2006 to 2009 at the MRR site.

In 2009, the estimated annual average PM_{10} concentration for the MRR site is $12 \mu\text{g m}^{-3}$. This is lower than the annual average PM_{10} concentration for 2008 of $16 \mu\text{g m}^{-3}$ and is more similar to previous years (e.g., 2007 - $11 \mu\text{g m}^{-3}$ and 2006 - $14 \mu\text{g m}^{-3}$). Some higher annual average concentrations were also estimated for 2000 and 2001 (Table 3.1).

Table 3.1: Summary of PM₁₀ concentrations measured at the MRR monitoring site from 2000 to 2009

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
"Good" 0-33% of guideline	39%	55%	59%	58%	80%	55%	61%	85%	69%	77%
"Acceptable" 33-66% of guideline	56%	34%	36%	33%	17%	37%	35%	15%	21%	23%
"Alert" 66-100% of guideline	4%	11%	5%	7%	3%	9%	4%	0%	8%	0%
"Action" >Guideline	2%	0%	0%	1%	0%	0%	0%	0%	1%	0%
Percentage of valid data	15%	20%	22%	22%	16%	25%	33%	32%	31%	32%
Annual average ($\mu\text{g m}^{-3}$)	18	16	15	16	13	17	14	11	16	12
Measured PM ₁₀ concentrations above 50 $\mu\text{g m}^{-3}$	1	-	-	1	-	-	0	0	1	0
Extrapolated PM ₁₀ concentrations above 50 $\mu\text{g m}^{-3}$									3	0
99.7 %ile concentration ($\mu\text{g m}^{-3}$)	53	46	40	67	46	47	42	27	48	31
Annual maximum ($\mu\text{g m}^{-3}$)	56	48	41	75	49	49	45	28	51	29
Number of records	54	74	81	81	60	93	121	116	113	118

3.2. PM₁₀ concentrations at Redwoodtown - Bowling Club

One exceedence of 50 $\mu\text{g m}^{-3}$ was measured at Redwoodtown during 2009 (Figure 3.5). This was on 30 May when the 24-hour average PM₁₀ concentration reached 51 $\mu\text{g m}^{-3}$. As the NES allows one exceedence of 50 $\mu\text{g m}^{-3}$ per year, no breaches occurred at this site. This is the first year of compliance since the introduction of the NES for PM₁₀ in September 2005.

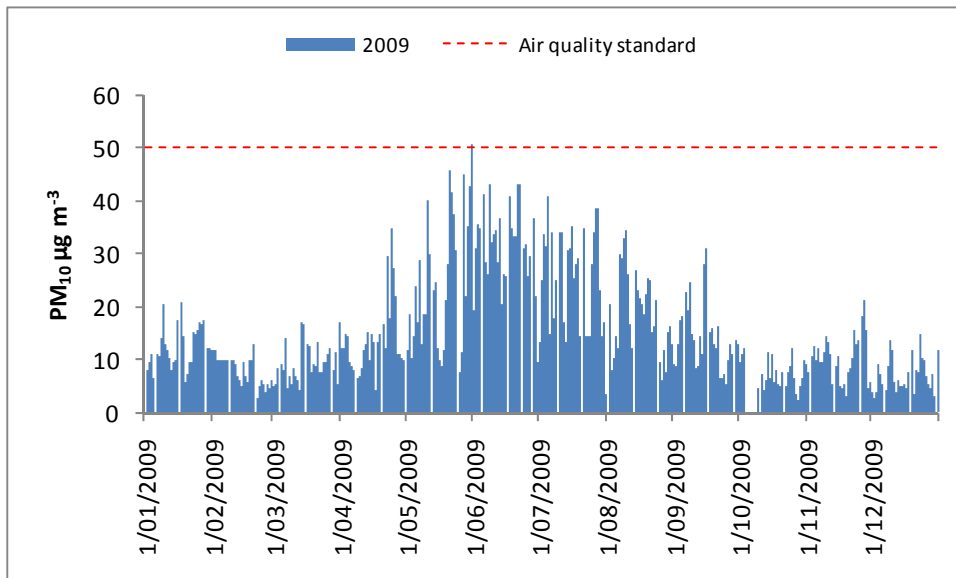


Figure 3.5: 24-hour average PM₁₀ concentrations measured at the Redwoodtown - Bowling Club site during 2009.

Daily PM₁₀ concentrations measured during 2006 to 2009 to the MfE air quality indicator categories (shown in Table 1.3) are compared in Figure 3.6. The majority of the PM₁₀ concentrations measured were less than 66% of the air quality guideline, within the “acceptable” and “good” air quality categories. The proportion of PM₁₀ concentrations in the alert or action categories for 2009 was 9%, compared with 10% in 2008 and 6% in 2007. While there were fewer exceedences of 50 $\mu\text{g m}^{-3}$, results do not indicate a decrease in the frequency of concentrations above 33 $\mu\text{g m}^{-3}$.

Figure 3.7 shows the monthly variations in the distribution of PM₁₀ concentrations for 2009. Figure 3.8 shows the number of days when the NES was exceeded, the maximum concentration and the second highest concentration for 2009 and for previous years.

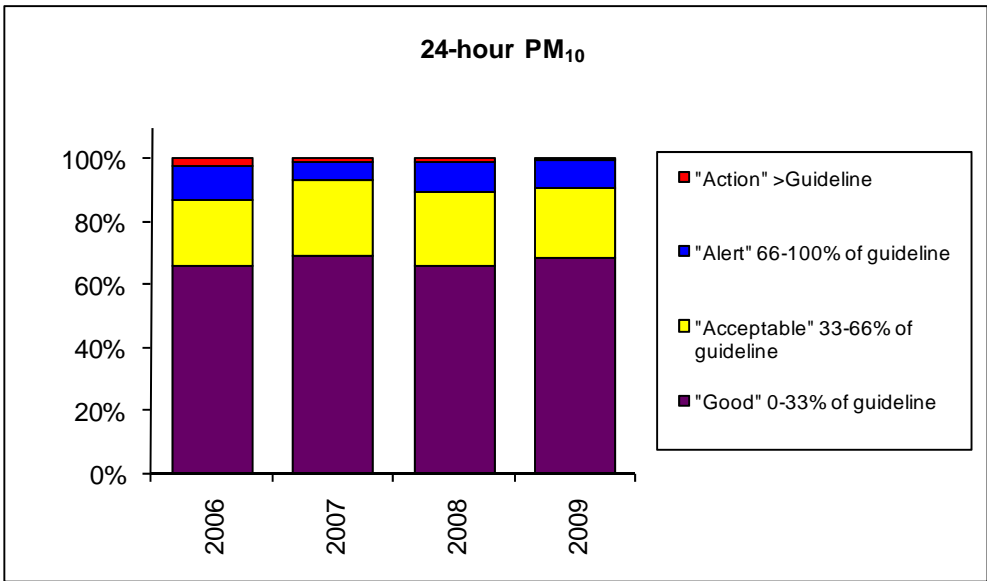


Figure 3.6: Comparison of PM₁₀ concentrations measured at Redwoodtown - Bowling Club site during 2006 to 2009 to air quality indicator categories.

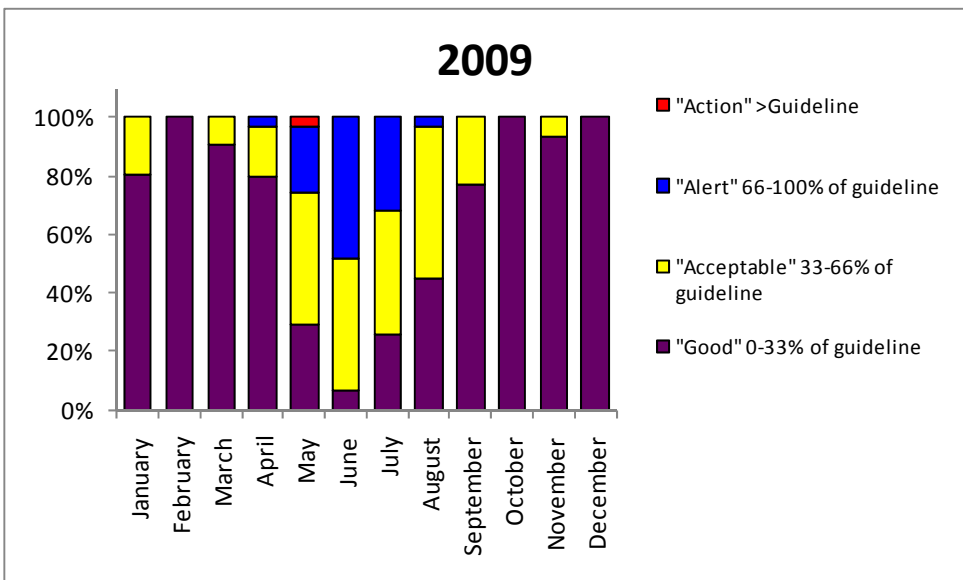


Figure 3.7: Comparison of daily PM₁₀ concentrations each month during 2009 to air quality indicator categories.

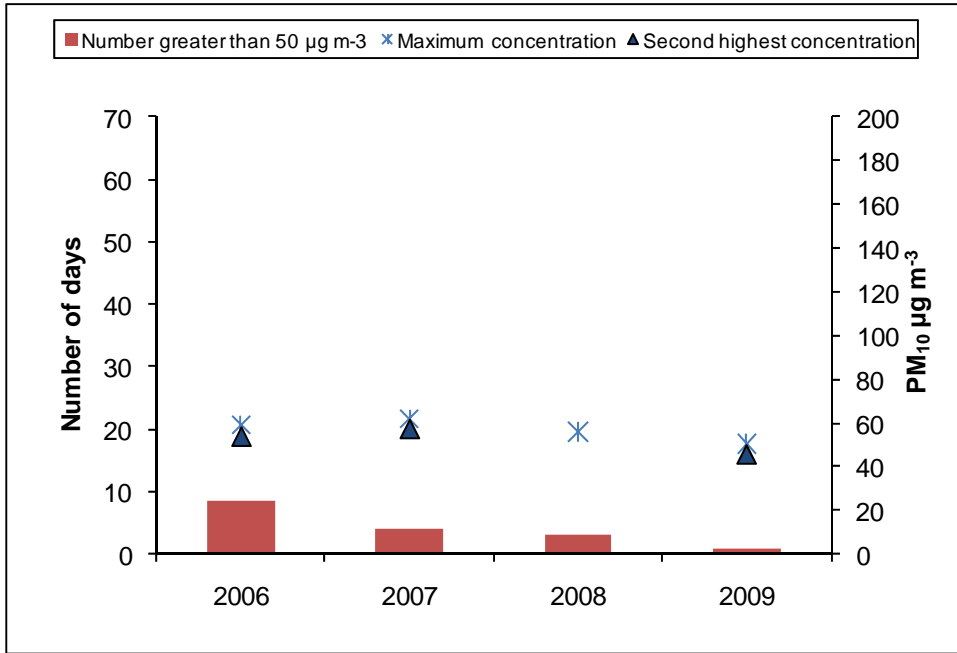


Figure 3.8: Number of days when $50 \mu\text{g m}^{-3}$ was exceeded, the maximum concentration and the second highest concentration from 2006 to 2009.

In 2009, the annual average PM_{10} concentration was $15 \mu\text{g m}^{-3}$. This is slightly lower than the annual average PM_{10} concentration for 2008 which was $17 \mu\text{g m}^{-3}$ but similar to previous years. The Ministry for the Environment specifies an annual average guideline for PM_{10} of $20 \mu\text{g m}^{-3}$. The NES does not include an annual average concentration for PM_{10} .

Summary statistics for PM_{10} monitoring results from the Redwoodtown - Bowling Club site since monitoring commenced in 2002 are provided in Table 3.2. It is noted that the monitoring period has varied from year to year. From 2005 monitoring was conducted from January to December and in 2004 air quality monitoring took place at a site in Brooklyn Street.

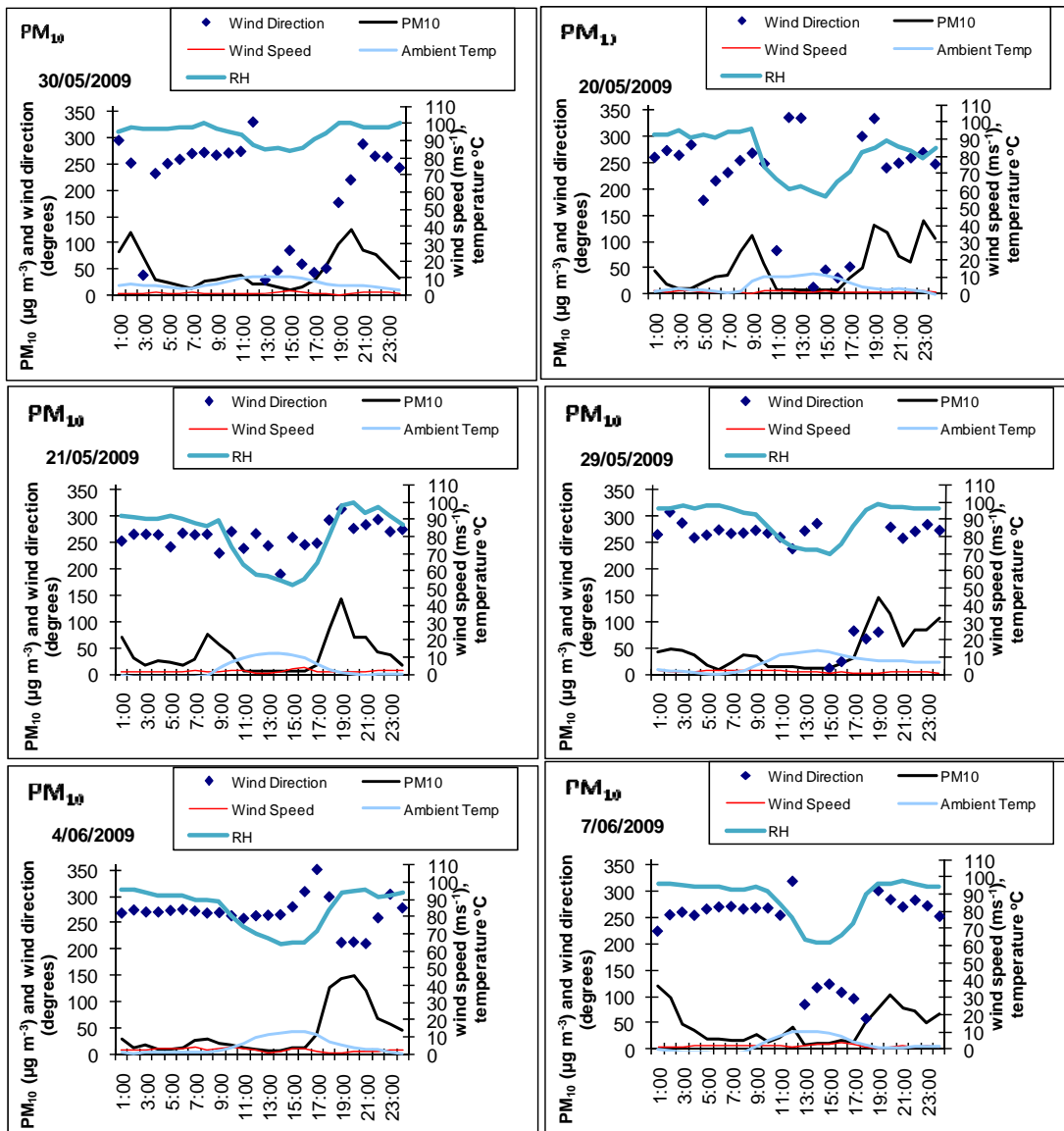
Table 3.2: Summary of PM₁₀ concentrations measured at Redwoodtown - Bowling Club site from 2002-2009

	2002	2003	2004	2005	2006	2007	2008	2009
Monitoring method	Hi-vol	Hi-vol	Hi-vol	Hi-vol	BAM	BAM	BAM	BAM
"Good" 0-33% of guideline	18%	22%	46%	63%	66%	69%	66%	68%
"Acceptable" 33-66% of guideline	62%	30%	22%	17%	21%	24%	23%	22%
"Alert" 66-100% of guideline	10%	26%	20%	17%	10%	6%	10%	9%
"Action" >Guideline	10%	22%	12%	3%	3%	1%	1%	0%
Percentage of valid data	14%	7%	22%	32%	68%	99%	99%	98%
Annual average ($\mu\text{g m}^{-3}$)	-	-	22	18	17	15	17	15
Measured PM ₁₀ concentrations above 50 $\mu\text{g m}^{-3}$	5	6	10	3	6	5	3	1
Extrapolated PM ₁₀ concentrations above 50 $\mu\text{g m}^{-3}$	16	34	31	9	10	4	3	1
99.7 %ile concentration ($\mu\text{g m}^{-3}$)	58	60	79	57	55	57	55	46
Annual maximum ($\mu\text{g m}^{-3}$)	58	60	81	58	59	62	56	46
Number of records	50	27	82	115	247	360	363	357

3.3. PM₁₀ and meteorology in Blenheim

Variations in meteorological conditions and hourly average PM₁₀ concentrations on days when the 24-hour average exceeded 40 µg m⁻³ (20 May, 21 May, 29 May, 30 May, 4 June, 7 June, 16 June, 20 June, 21 June and 4 July) are shown in Figure 3.9.

The daily variations in PM₁₀ concentrations on 30 May, when concentrations exceeded 50 µg m⁻³, are typical of a high pollution event in Blenheim which often occur when wind speeds are low and the wind is from a westerly direction. Similar conditions are observed on most other days when concentrations exceeded 40 µg m⁻³. The highest hourly average PM₁₀ concentrations typically occur during the evening period when low winds and temperature inversion conditions coincide with households lighting fires for home heating.



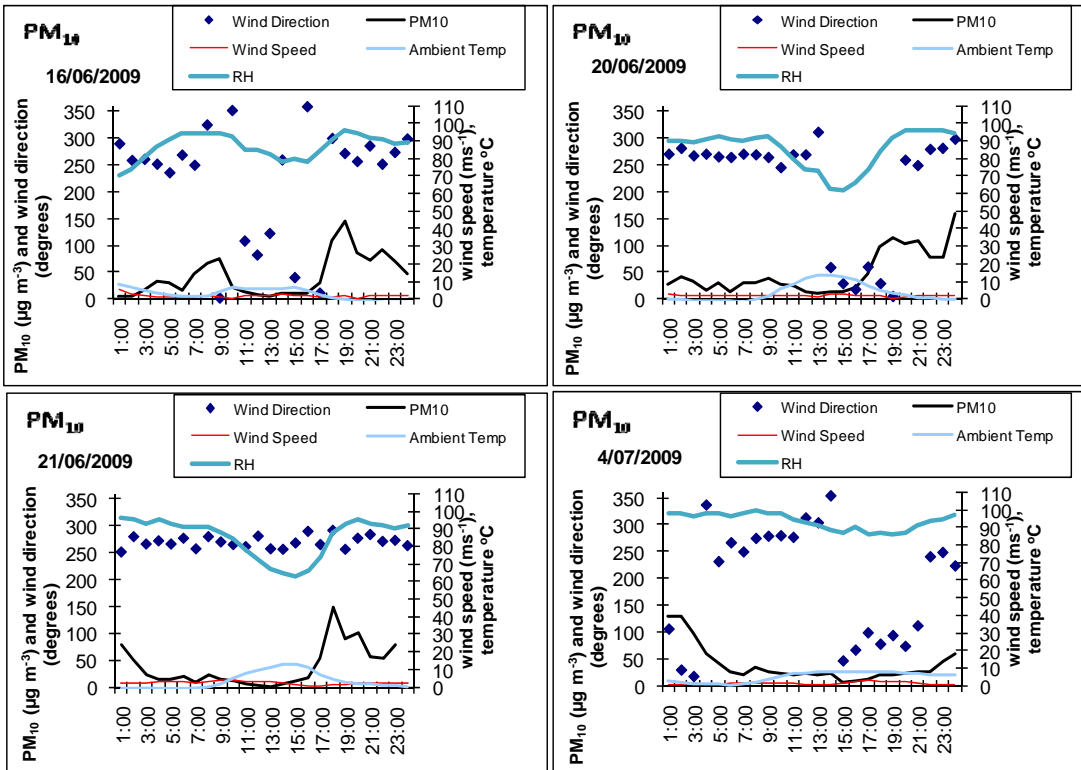


Figure 3.9: Hourly average wind speed and wind direction when PM₁₀ concentrations exceeded 40 µg m⁻³ (24 hour average) at Blenheim.

4. Air Quality Monitoring in Picton

4.1. PM₁₀ concentrations at Lincoln Street

No exceedences of 50 $\mu\text{g m}^{-3}$ (24-hour average) were recorded during 2009 at the Picton site. The highest PM₁₀ concentration was 31 $\mu\text{g m}^{-3}$. Twenty four hour average PM₁₀ concentrations measured during 2009 are shown in Figure 4.1. Monitoring in Picton ceased in September 2009 due to the air monitor having to be relocated to an alternative site because of construction works. It is envisaged that monitoring will recommence at an alternative location in the environs of Lincoln Street by May 2010.

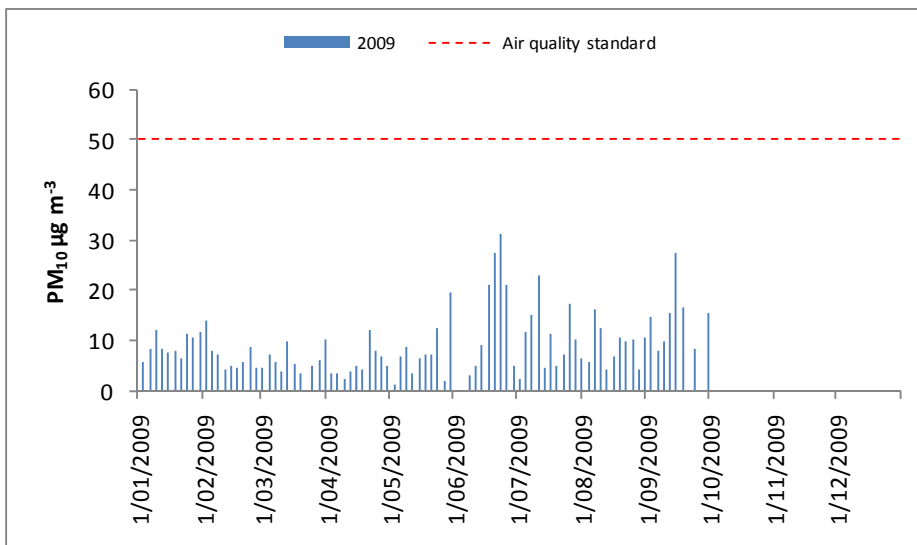


Figure 4.1: 24-hour average PM₁₀ concentrations measured in Picton during 2009.

A comparison of PM₁₀ concentrations measured during 2008 and 2009 to the air quality indicator categories is shown in Figure 4.2. Ninety nine percent of PM₁₀ concentrations measured were less than 66% of the air quality guideline, within the “acceptable” and “good” air quality categories. Figure 4.3 shows the monthly variations in the distribution of PM₁₀ concentrations for 2009. Figure 4.4 shows the number of days when the NES was exceeded, the maximum concentration and the second highest concentration for 2009 and for previous years.

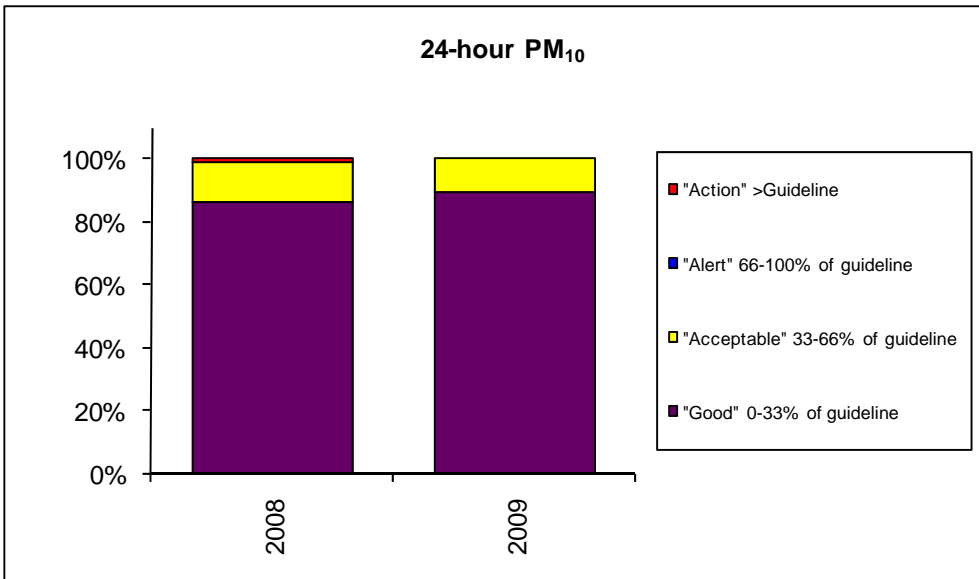


Figure 4.2: Comparison of PM₁₀ concentrations measured at Picton from 2008 and 2009 to air quality indicator categories.

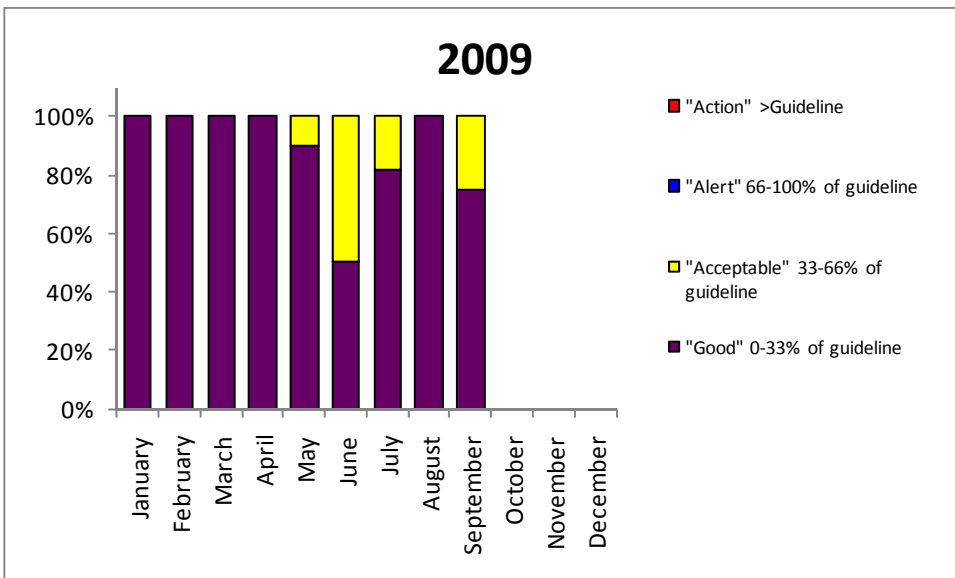


Figure 4.3: Comparison of daily PM₁₀ concentrations each month during 2009 to air quality indicator categories.

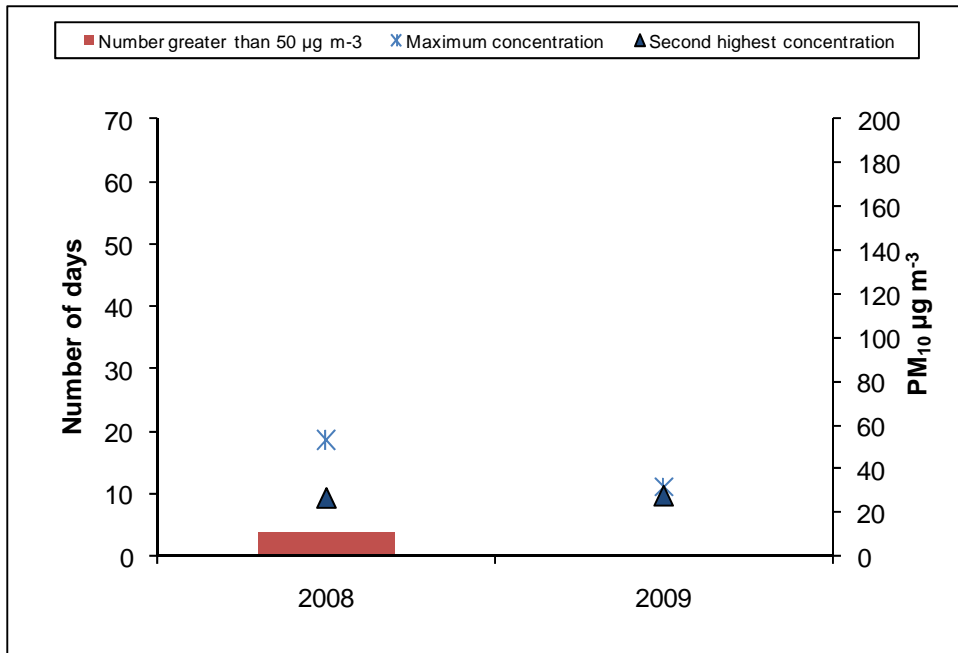


Figure 4.4: Number of days when the NES was exceeded, the maximum concentration and the second highest concentration during 2008 and 2009.

Table 4.1 shows summary statistics for PM_{10} monitoring results from the Picton site for 2008 and 2009. Results suggest an annual average concentration of around 10 -11 $\mu\text{g m}^{-3}$ in Picton. This is about half of the annual average guideline for PM_{10} of 20 $\mu\text{g m}^{-3}$.

Table 4.1: Summary of PM_{10} concentrations measured at Picton

	2008	2009
"Good" 0-33% of guideline	86%	90%
"Acceptable" 33-66% of guideline	13%	10%
"Alert" 66-100% of guideline	0%	0%
>Guideline	1	0%
Percentage of valid data	20%	24%
Annual average ($\mu\text{g m}^{-3}$)	10	11
Measured PM_{10} concentrations above 50 $\mu\text{g m}^{-3}$	1	0
Extrapolated PM_{10} concentrations above 50 $\mu\text{g m}^{-3}$	4	0
Annual maximum ($\mu\text{g m}^{-3}$)	53	30
Number of records	72	86

5. Straight line path (SLiP)

The NES requires that Councils develop a straight line path (SLiP) to show compliance with the NES by 2013. The reductions required in PM₁₀ concentrations to meet the NES have been estimated based on existing monitoring data (Wilton et. al., 2008).

The recommended approach for developing the SLiP where there are sufficient monitoring data is to exclude the maximum PM₁₀ concentration measured each year and to then evaluate the reduction based on the highest remaining concentration. The maximum concentration is excluded because the NES allows for one breach of 50 µg m⁻³ (24-hour average) per year.

The starting point for the SLiP was re-evaluated in 2007 (Wilton, 2007) and was set at 66 µg m⁻³. This was based on the highest measured concentration for 2007 adjusted for the difference between the BAM and gravimetric sampling methods. The more conservative approach of using the highest measured concentration was used because at the time only a few years of monitoring data for the Redwoodtown site were available. Figure 5.1 shows that the second highest PM₁₀ concentration measured in Blenheim during 2009 was well within the SLiP.

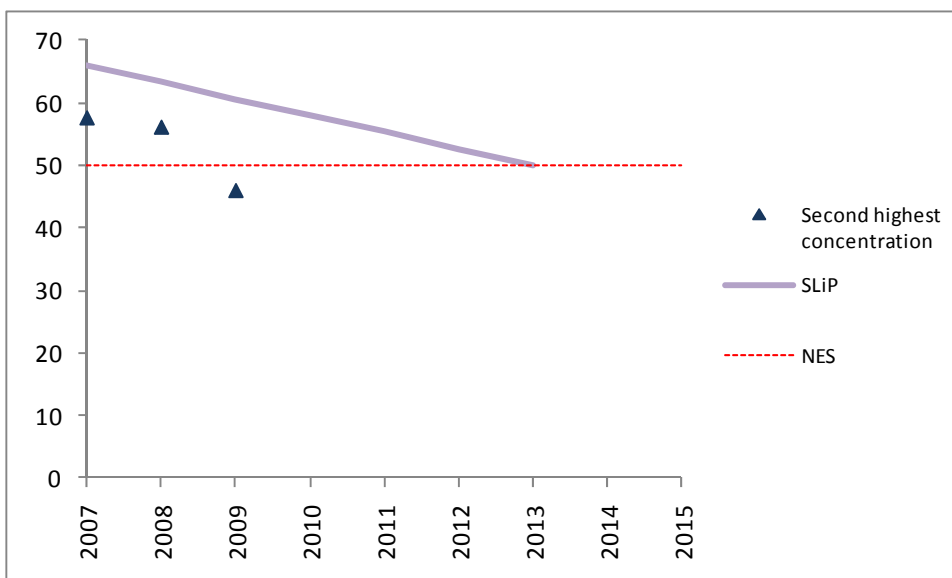


Figure 5.1: Comparison of PM₁₀ concentrations measured from 2007 to 2009 to the straight line path to compliance with the NES.

6. Summary

Concentrations of PM₁₀ were measured at the MMR site and the Redwoodtown Bowling air quality monitoring sites in Blenheim during 2009.

There was one exceedance of the 50 µg m⁻³ measured in Blenheim at the Redwoodtown monitoring site in 2009. This was 51 µg m⁻³ (24 hour average) and was recorded on the 30th May. Concentrations were therefore within the straight line path to compliance with the NES and there were no breaches of the NES for PM₁₀ in Blenheim during 2009.

In Picton, the maximum measured PM₁₀ concentration during 2009 was 31 µg m⁻³ (24-hour average). While there were no measured exceedances of 50 µg m⁻³, sampling was carried out on only one day in three so it is possible that concentrations exceeded 50 µg m⁻³ on a non sample day. Previous monitoring in Picton during 2008 resulted in one measured exceedance of 50 µg m⁻³.

Annual average PM₁₀ concentrations measured or estimated (in the case of gravimetric sampling) at the three sites for 2009 were 15 µg m⁻³ (Redwoodtown - Bowling Club), 12 µg m⁻³ (MMR site), and 11 µg m⁻³ (Picton).

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